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EDITORIAL

The Indian Coffee Control Scheme. None interested in the Indian Coffee Industry would have failed to appreciate the significance of the announcement made in the Legislative Assembly (Central), on the 15th November by the Honourable Sir A. Ramaswamy Mudaliar, the Commerce Member, that the recommendations made by the Conference of Coffee Producers and Merchants held at Madras in September last, were under the active consideration of the Government of India and a Bill very much on the lines of those recommendations would be introduced in the Assembly during this session. There is no need for any speculation on the provisions of the Bill, as it will become a public document within a few days. But the circumstances that led to this emergent legislation and what it aims to achieve are alone of interest to us. India has for long established a reputation in the world's markets as a producer of one of the finest coffees of the world, but for various reasons, of which the most important is the increasing competition in foreign markets from superior as well as inferior but cheaply produced coffees, the Indian Coffee Industry has been on the decline for the past several decades. From three lakhs of acres, the area under coffee in India has steadily fallen to the present acreage of about two lakhs. Gone are the days when the coffee planter received remunerative prices for his coffee. Instead of amounts approximating Rs. 1800 per ton, he would now be thankful for much smaller mercies say, Rs. 700 per ton, which would enable him to keep himself and his estate going. Since 1936, things have been looking up for a time, but the present war, and, particularly the collapse of France and the fall of Norway, Denmark and Belgium have rendered the plight of the Indian coffee grower almost desperate. Of the normal total annual production of coffee in India—estimated at about 18,000 tons—about 10,000 tons alone are required for consumption in India. To dispose of the balance of 8,000 tons, India must, perforce, seek the remaining foreign markets which are flooded with the 2 to 2½ million tons of bad, indifferent and good coffees produced in the rest of the world, in many cases at comparatively lower cost per ton or as in some others under tariff protection. Even under normal conditions, the fight Indian Coffee had to put up for a place in foreign markets was unequal. Under the abnormal conditions created by the present war, the

position of Indian Coffee has become worse, to a degree unprecedented in the history of the Industry. The European markets which used to absorb annually over 5,000 tons of Indian Coffee have vanished; the off-take to the United Kingdom and countries in the Near and Middle East must necessarily be erratic due to shipping difficulties. The only external markets, still open to Indian Coffee and fairly dependable, are Burma Ceylon, New Zealand and Australia which take about 500 tons. What this state of affairs has in store for the industry can readily be foreseen. In the absence of a sheme of controlled production and marketing, a collapse in prices is inevitable, and production will have to be curtailed by abandonment of estates and about half the present acreage under coffee may have to go out of cultivation. From the trend of discussions that took place in Madras, the Coffee Control Scheme now on the legislative anvil, sets out, to correct this position, so far as is humanly possible, by securing for the producer of coffee as high a return as practicable. We trust that the contemplated legislation will rescue the industry from its present unenviable plight and restore it to a position of security in which the interests of the producer would be safe-guarded to the largest measure possible.

Coorg oranges. One of the research schemes recently approved by the Imperial Council of Agricultural Research is the improvement of the cultivation and marketing of Coorg oranges. Propagated exclusively from seed, this luscious fruit is grown largely in the rain-fed hill slopes of Coorg, Madras, Mysore and Travancore, where its cultivation is spreading rapidly. Insufficient knowledge on better methods of propagation, manuring, pruning, control of pests and diseases and marketing, now bring poor returns to the producer. The seedling trees take anything from eight to twelve years to come into normal bearing and in several districts there is a definite deterioration in production after 20 to 25 years, so that replanting becomes necessary. We trust that the scheme of research will deal adequately with all the needs of the growers and eventually set this important industry on a sure footing.

Role of Bran during the Germination of Rice.

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Introduction. The rice grain during the resting stage shows very little of active enzymes. However, during the germination of seeds, the increase in enzymes is rapid. The seat of production of these enzymes, especially that of diastase, was investigated by scientists both by directly observing the histological changes in the cell contents during the germination of the seeds and also by examining the vitality possessed by different parts. Three parts of the seeds are essentially concerned in the production of enzymes during their germination viz. embryo, endosperm and aleurone layer. Evidences are strong to show that the epithelial layer of the scutellum secretes diastase; but the results of the previous investigators are contradictory with regard to the enzyme secreting capacity of the endosperm and the aleurone layer.

Historical. The consideration of the possession of vitality by different parts of the seeds is essential, since the secretion can take place only in living and growing parts and not in those parts which do not possess cellular organisation. From the investigations of Bonnet (1754), Sachs (1859), Gris (1864) and many others, it is difficult to judge whether the endosperm possesses vitality or not.

Haberlandt (1894) expressed that aleurone layer is secretory in function. Brown and Morris (1890) are of opinion that the proteid reserve of aleurone layer is used in the late stages of germination. They do not find an appreciable quantity of enzyme in the aleurone layer and its enzymic activity later in germination is due to the accumulation of the same formed during the germination. Stoward (1911) observed that the cytological changes in the aleurone layer were closely similar to those of columnar epithelium in barley. Nuclear and cytoplasmic changes synchronised with these phenomena in the epithelium. This justifies the view that the aleurone layer is secretory in function. Schander Helmet (1935) studied the effects of removing some or all of the aleurone layer in wheat, barley, oat and rice. In rice the removal of aleurone layer proportionately checked the growth so long as there was a connection between this layer and the scutellum, and the breakage of this connection was as good as the removal of the whole aleurone layer. The conclusion of the author is that the endosperm or aleurone layer furnishes a growth-activating substance that passes to the embryo during the swelling stage of germination, and that thereby the embryo is enabled to provide the endosperm with starch-digesting enzymes. From the foregoing literature it is seen that the diastase secretory powers

* Summary of part of the Thesis approved by the University of Madras in 1937 for the award of M. Sc. degree.

of the epithelium of the scutellum is unquestioned whereas those of aleurone cells and endosperm are doubtful.

Material and Method. The previous investigators have been studying this question by following cytological changes in that layer or by noting the changes in the starch grain underlying this layer. In the experiments of Stoward (1911) the different parts were removed and grown in cultures and so these do not represent the conditions *in vivo*. In the following pages, the effect of the removal of the bran on the quantity of diastase secreted is discussed.

The paddy strain, GEB 24 of the Coimbatore Paddy Breeding Station was taken up for study. Husked rice was kept for germination removed at intervals, and kept for drying at 30°C for 24 hours. The seeds were separated into bran, embryo and endosperm and the diastase contents of the different parts were estimated. A blank was run without the starch and the reducing sugars in the material was accounted for before the quantity of diastase was calculated. Twenty-five seeds were taken for each experiment and the separated parts were well pulverised and added to 10 cc. of 1 % starch solution and the reaction was allowed to proceed for one hour at 40°C. The reducing sugars formed were estimated by Schaffer and Hartmann method as modified by Fred, Peterson and Stiles (1926). The quantity of diastase in 100 seeds in terms of mg. of glucose was then calculated.

Experiment 1. In this experiment, husked rice was germinated and then separated into different parts viz., embryo, pure endosperm and bran, and the quantities of diastase present in these three parts were estimated. The data are presented below.

TABLE I. Diastase in different parts of germinating rice seeds.
(Quantity for 100 seeds.)

Hours after soaking.	Embryo.	Endosperm.	Bran.
48	45·68	69·36	16·80
72	42·08	85·92	24·08
96	104·48	139·04	29·68
120	89 28	111·76	49·76

The above results show that with the increase in the period of soaking there is a steady increase in the diastase of all the parts. Embryo and endosperm show a set-back on the fifth day, whereas the bran shows an increase through-out. The bran contains the least quantity.

Experiment 2. In this experiment the bran on the seed was completely removed before keeping them for germination. The seeds show signs of germination and the radicle emerges only to one or two mm.

TABLE II. Quantity of diastase in rice seeds when they germinate without bran.
(Quantity for 100 seeds.)

Hours after soaking.	Embryo.	Endosperm.
48	6·88	13·52
72	3·52	12·56
96	5·36	10·00

This experiment shows that the absence of bran has caused a great decrease in the amount of diastase secreted during the germination of rice.

Experiment 3. In this experiment bran was ringed out near the embryo leaving a large portion at the distal end of the seed but unconnected with the embryo. The analysis for diastase content on the second and third days showed that the embryo contained 3·52 and 3·50 and the endosperm contained 5·64 and 5·36 respectively, in terms of glucose for 100 seeds.

Experiment 4. In this experiment bran was ringed out at the distal end (i. e., away from the embryo) leaving a large portion in touch with the embryo. In this case the seeds germinated well. The diastase contents on the second and third days were : embryo, 44·64 and 53·76 respectively; endosperm. 61·76 and 82·88 respectively. Since the diastase content is not reduced, it is evident that the contact of the embryo with the bran is essential for the diastase secretion.

Experiment 5. In this experiment, the embryo was connected to the bran through the dorsal and ventral veins only. The bran on the lateral sides of the proximal half of the seed was removed. Thus the contact between the bran situated at the distal half of the seed and the embryo was maintained through the dorsal and ventral veins. The seeds germinated well.

TABLE. 3. Quantity of diastase in germinating rice seeds with bran connected to the embryo through the dorsal and ventral veins only.

(Quantity for 100 seeds.)

Hours after soaking.	Embryo.	Endosperm.
48	6·88	14·76
72	11·36	44·16
96	12·56	28·56

The establishment of contact between the embryo and bran has resulted in a liberal secretion of diastase. The reduction in the extent of contact has reduced the diastase content.

Experiment 6. This experiment was planned to find out whether the contact of the bran is essential through-out the course of germination. In the germinating seeds, the bran was ringed out near the embryo, 6, 12, 24 and 48 hours after first soaking and the germination was allowed to proceed further. The analyses for the diastase contents showed, that, the longer the contact of the embryo with the bran, the greater the secretion. Even if the contact is broken 6 hours after soaking, the secretion is fairly large. The diastase content of the bran itself was very small. This shows that the secretion is not essentially in the bran.

Experiment 7. To find out if the bran secretes diastase in the absence of the embryo, the seeds were degermed and germinated. There was practically no increase in diastase.

Experiment 8. Embryos of rice seeds were carefully separated twelve hours after soaking. In one case a small portion of the endosperm was left attached to the embryo, and in another case the endosperm was removed as completely as possible.

TABLE. 4. Quantity of diastase in germinating excised embryos.

(Quantity for 100 embryos)

Hours after soaking.	Embryo only kept for germination.	Embryo with a bit of endosperm kept for germination.
48	30·08	32·64
72	54 80	72·88
96	59 76	90·40

There is a progressive increase in the diastase content of the embryo even when it is kept alone for germination. When a small portion of the endosperm is in contact with the embryo the secretion is greater.

Discussion. From the foregoing experiments it is clear that the bran plays an important role during the germination of rice, not by the secretion of diastase, but by enabling the embryo to secrete the same. The investigations of Schander Helmet and Brown and Morris show that there is a flow of some material from the aleurone layer to the embryo during the early stages of germination. The above experiments show that the contact of the embryo with the bran is essential only in the early stages and that the bran does not contribute diastase by way of secretion. How the bran enables the embryo to secrete more diastase is not clear.

Diastase is a complex enzyme possessing two components viz., α amylase and β amylase. Nordh and Ohlson (1933) are of opinion that the dormant seeds contain only α amylase while β amylase appears only during the sprouting of the seeds. Recent investigations of Giri and Sreenivasan (1936) show that α and β amylases are both present in the rice seed in an insoluble form in the dormant stage and that they become soluble only during the germination process. They contend that Ohlsson's view that α amylase arises only during the germination of seeds is untenable. Waldtschmidt-Leitz *et al* consider that the increase in diastase during the germination is due to 'amylokinase' or to an increase in the soluble part as a result of proteolytic decomposition.

To test whether the bran layer contained any substance which is capable of rendering the inactive amylases of rice active, the following experiments were conducted :

Since the diastase present in small quantity in ungerminated seed is not soluble in water, it is clear that the bean of the ungerminated seed does not possess any activating substance. Such an activating substance may arise there during the process of germination. Hence the bran from seeds germinated for 3 days was taken. The diastase content of the seeds increases during the first 24 hours of germination but it is not evident in the extract

i. e., the enzyme is not soluble. Seeds germinated for one day were taken powdered, water added and also 0·2 gm. of the bran from the three-day germinated seeds. The diastasic activity was tested after 24 hours. There was no diastase in the extract. This shows that the bran does not play the role of activating the inactive α and β amylase in rice. Probably it supplies some important ingredient to the embryo which enables the latter to do that function.

The solubility of the two amylases in the seeds germinating with and without bran was tested by Venkata Giri's (1934) iodine colour test using agar-starch as substrate. The colours of the rings formed at different stages of germination were tested both by using the materials direct and by taking their water extract.

TABLE V. Giri's colour tests for α and β amylases.

Hours after soaking.	Normal seeds.		Branless seed.	
	Material	extract.	Material	extract.
0	V. W.	...	V. W.	...
24	V. W.	V.	V. W.	...
48	V. W.	V.	V. W.	...
72	V. W.	V. W.	V. W.	...

V. = Violet colour.
V. W. = Violet ring with white centre.

The foregoing table shows that both α and β amylases are present in the seeds even from the beginning, whereas they are not present in the extracts in the initial stages of germination. β amylase becomes active before the α does. Both the amylases are absent in the extracts from the seeds germinated without bran portion. Presence of bran during extraction showed no difference in colour tests. This shows that the bran does not play the role of rendering the insoluble α and β amylases soluble. From Table 5 it is evident that β amylase is first rendered active.

Conclusion. The absence of bran causes a considerable decrease in the quantity of diastase secreted during the germination of rice. The presence of bran on the seed, without there being any contact between this part and the embryo shows the same effect as the complete removal of bran from all over the seed. This shows that the bran sends some important substances to the embryo which enables the latter to secrete diastase abundantly. The contact between the embryo and the bran is not essential through-out the germination period, but if the bran is removed a few hours after the soaking of the seed, the scretion is not interfered with. The longer the contact in the early stages of germination, the larger was the quantity of secretion. The diastase present in the bran is very little and it does not secrete any significant amount in the absence of embryo. Therefore it may be concluded that the bran translocates some important substance to the embryo, which enables the latter to secrete large quantities of diastase. The iodine colour tests showed that the bran did not play any,

part in rendering the amylases soluble ; and also that β amylase was rendered soluble first.

Summary. The experiments have definitely proved the importance of bran during the early stages of germination. The break in the contact between the embryo and bran has the same effect as the complete removal of bran. The translocation of substance from the bran to the embryo takes place within six hours after soaking of the seed. β amylase is rendered soluble in water first and later only the α amylase is rendered soluble.

Acknowledgments. This investigation was undertaken under the auspices of the University of Madras. I am grateful to my professor Mr. K. Ramiah, M. B. E., the then Paddy Specialist to the Government of Madras for suggesting the problem and guidance in my work. I am also indebted to Mr. P. V. Ramiah, Government Agricultural Chemist and Mr. P. D. Karunakar, Agricultural Bacteriologist for having given me facilities in their laboratory for carrying on the investigations and to Mr. T. Rajagopala Iyengar for helping me in the course of the experiments.

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Tea Cultivation in South India *

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(Concluded).

Pests and Diseases. There are many diseases which attack tea and nearly all are fungal parasites. The fungal root diseases are the worst as they almost always kill the bushes they attack; so I shall describe some of these first.

Root diseases. The commonest root diseases in South India are probably *Ustulina zonata* and *Fomes lamaoensis.* The former fungus grows freely on dead Grevillea (silver oak) stumps and from them passes on to living tea bush roots along the lateral roots of the Grevillea so that often where a dead Grevillea tree has not been properly rooted out a patch of several dead tea bushes will be found round about it. In such a case the best way of stopping the disease spreading further is after carefully rooting out Grevillea stump and dead tea bushes and all their roots, to ring the infected area with a 2 foot deep trench, throwing the earth from the trench inside the ring. This is the most efficacious treatment for any root disease. When single dead bushes are found they and all their roots are carefully removed and burnt. Various chemical treatments have been tried, but have never proved to be of any real use. Years ago before it was discovered that lime was bad for tea, the soil around a diseased area was heavily limed in the mistaken belief that this would kill the fungus. Ferrous sulphate is sometimes used but has not been proved to do any good The best way to keep root diseases under control is to have a system whereby bushes showing signs of disease are rooted out immediately. This cannot be done by putting on a few coolies to search up and down each field once a month, which is the haphazard method employed on many estates. There must be a system by which one or two men with digging tools accompany each gang of pluckers, and the pluckers and plucking maistries are trained to call them and point out dead or dying bushes. In this way, diseased bushes should not be missed and would be removed weekly so reducing the chances of fructifications forming on the dead wood and spores becoming distributed.

In the case of *Ustulina* the fungus does not spread through the soil but spreads from root to root when in contact. It shows up as black rings inside the bark in a transverse section of a diseased root, and in brownish patches when the bark is peeled off longitudinally. *Fomes* can be recognised easily from the way the mycelium causes a crust of earth to adhere to the

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outside of the diseased root. Inside the root the disease shows up as a honeycomb of brownish orange markings. Another fairly common root disease is *Rosellinia arcuata*. This shows up as a black spongy mass on the outside of the bark of the diseased root, but penetrates through the bark and forms large white star shapes, which are clearly visible between the bark and the wood.

Several other fungi have been shown to attack and kill the roots of tea such as *Diplodia*, *Poria*, other species of *Fomes* and *Rosellinia*, but these are uncommon. There is also a fungus which attacks the newly formed rootlets of germinating tea seed and causes them to drop off.

Stem Diseases. Various fungi attack the stems of tea bushes causing canker and 'die back' but do not usually kill the bush. Bad cankering occurs on the upper surfaces of the main branches, spreading up from the centre of the bush and finally continuing as holes running through the centres of the branches. If the canker gets very bad it is necessary to collar-prune the bush. Other types of canker show as splits in the bark caused by the fungus penetrating as far as the cambium layer of the stem and killing it in patches. 'Die-back' is the popular name given to the diseases which attack the branches of a bush from their green tips and cause them to die right back to the centre. Usually outer branches are attacked first. Occasionally every branch of a bush will become infected and the whole bush has to be removed. These diseases are usually ascribed to species of *Nectria*. There are various mild blights which do little or no harm, and such epiphytes as mosses, liver-worts, and lichens cover the lower stems, and are cleaned off at each pruning. A very weak solution of caustic soda is sometimes used for this cleaning, but usually the plants are removed with just a damp piece of cloth or sacking.

Leaf and stem diseases. An algal disease which has caused extensive damage in North India has been found in South India, but its ravages do not seem to be so severe in the hill districts. This is 'red rust' (*Cephaleuros parasiticus*) which can be recognised by a fur of little red hairs on the green stem and leaves. These are the sporangiophores of the alga which have pushed through the epidermis. The worst leaf and stem disease in S. India is probably 'Black rot' (*Corticium*). This fungus spreads over the stem and the leaves of bushes, causing the leaves to blacken and rot and finally after a period to fall off, the rotting leaves tend to stick together Whole patches of tea become infected with this disease during the heavy rains and present a blackened rotting appearance, but when drier weather and bright sunshine return, the dead leaves fall off, and new buds appear, and soon the bushes can be brought back into plucking. On some estates gangs of labourers are put on to collect off all the dead leaves and blackened twigs and to collect the fallen diseased leaves and burn the lot. As the fungus is present on the bigger branches also this method cannot eradicate it. Nor is it possible to spray infected bushes with the usual fungus killing copper sulphate sprays (Bordeaux or Burgundy

mixtures) as the attacks occur during the heaviest rains. It is the writer's confirmed opinion that the best way to treat the disease is to leave it severely alone, making the pluckers also avoid touching the bushes when passing through the fields. The writer has adopted this policy for the last three years, and during this last South West Monsoon there was nothing like the amount of black rot on his estate that there was on surrounding estates which have spent Rs. 300 to 400 a year for the last four years on collecting and burning. Probably the best plan would be to mark the infected areas at the time of infection, and spray the bushes all over with Bordeaux mixture as soon as the weather makes this feasible.

Leaf Diseases. There are various blights which attack the leaves of tea in S India, but these do very little damage to mature tea bushes as they only seem to attack a few leaves here and there. Grey Blight (*Pestalozzia Theae*) turns the attacked leaves grey, Brown blight (*Colletotricum Camelliae*) turns them dark brown, Copper blight (*Gingrardia Camelliae*) to a copper colour which later fades to grey, Sooty mould (*Meliola*) covers the leaves and twigs with a black powdery mould. This last named is dependent on the presence of insects, but seems to do no harm to the bushes. It looks ugly, and it seems to have spread in the Anamalai district a lot in recent years. While these blights do no harm in old tea their ravages in nurseries become serious if not checked by spraying.

Animal Pests. The most serious of these is undoubtedly eel worm (*Heterodera marioni*) in tea nurseries (see the first article on nurseries). This parasite is present in sour water-logged soil and will kill off eventually all the plants in a nursery if it once gets in unless the uninfected plants are quickly removed (i.e. in the case of a basket nursery) to another situation.

Termites eat away decayed wood on tea bushes, but one species will attack the living tissue also, eventually hollowing out the entire inner frame work of the bush right down to the main tap root. This species is *Calotermes militaris.* Because of the ravages of termites in buildings most planters pay half an anna or even an anna for every nest brought in, and by this means hundreds of nests are destroyed annually per estate, and the pest has considerably decreased.

Another pest that does a certain amount of damage is the shot hole borer, which bores a neat round hole straight down the centre of the branches. Its presence is usually only discovered at the time of pruning, when the affected branches should be pruned further and further down until the parasite is found and killed.

There are other parasites such as other boring grubs, worms, bag worms etc. but these do little or no damage.

While there are many more pests and diseases of tea, the writer has included in this article only those which he has seen and identifed himself, and considers these are sufficient to show that a good deal of care and money have to be spent on pest and disease control work.

I wish to close this final contribution by thanking the editorial board for requesting me to write a series of articles on the subject of Tea cultivation and for finding space in the *Madras Agricultural Journal* for my elementary efforts at giving some idea of tea cultivation to those who previously knew nothing of the subject.

The Annamalai University Colonisation Scheme.

By C. S. KRISHNASWAMI, L. Ag.,

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Introduction. In India, agriculture absorbs and provides employment to millions of our people. With a view to find out whether scientific farming would provide a decent income to the educated unemployed, Rao Bahadur Sri. M. R. Ramaswami Sivan, Retired Principal, Agricultural College, Coimbatore, made a special study of the colonisation scheme in progress in the Punjab. He had the opportunity for this study, when he visited Lyallpur. In the Punjab, extensive areas with irrigation facilities are available and such lands were assigned to graduates who were willing to colonize them and make agriculture their profession. The initial assignment of land was on a temporary basis but with the proviso that if the lands were properly cultivated and the colonies were kept in sanitary condition, permanent occupancy rights might be granted to the lessees any time after a period of 5 years The first batch consisting of 48 graduates from Arts, Science and professional colleges started the colony in 1932 and is still continuing as colonist farmers.

The Colonization Scheme. The impression created by the efficient working of the scheme in the Punjab made Rao Bahadur Ramaswamy Sivan enthusiastic to try a similar scheme for the benefit of the graduates and other educated men of this province. As a member of the Syndicate, he persuaded the Annamalai University to give a trial to a similar scheme utilizing the cultivable lands belonging to the University. The University permitted Mr. Sivan to start the scheme and allotted 100 acres of its lands rent free for this purpose. It also agreed to provide residence for the colonists and bear the cost of the permanent improvements to the lands. But it was not prepared to advance any sum to meet the cost of the live and deadstock, working expenses or the subsistence allowance to the colonists.

To find funds for the above purposes, a Co-operative society was formed and registered on 2nd May 1938 with the Vice-Chancellor and Registrar of the University as the ex-officio President, and Secretary respectively. Sympathisers of the scheme were also made eligible to become members of this Society and as many as 20 gentlemen have taken shares to the extent of Rs. 510, (at Rs 5 a share) Graduates of the Universities and other educated unemployed men who have at least completed their Secondary School Leaving Certificate and who are not below 18 years of

age were eligible to become colonist members. The candidates selected as colonists were to take at least 20 shares of Rs. 5 each payable in five quarterly instalments. They should also bind themselves to serve for five years in the first instance and must abide by the bye-laws of the Society. As the University cannot part with the lands to the colonists at any time or grant permanent occupancy right to any body, the scheme was intended to train the educated men for the profession of agriculture. These may later on be absorbed when the Provincial Government start any such scheme in the areas reported to be available as cultivable wastes in the several parts of the Presidency.

Initiation of colonization scheme. At the time of starting the scheme, four graduates joined the Society as colonist members but only two of them were able to take up the work. These two graduates have continued to do their work cheerfully for the last two years.

Based on the first year's experience, the bye-laws of the Society were considerably altered in the second year and are at present being considered for registration by the Registrar of Co-operative Societies. According to the original bye-laws, the individual colonists were made to share the profit or bear the loss in cultivating the land. The society was merely to act as a lending institution recovering the loan or advances given to the colonists at the end of the year. The main changes now made are that the Society as a whole instead of the colonists individually is to cultivate the lands and raise the crops, the colonists acting on behalf of the office bearers and under their instructions. Secondly, the remuneration to the colonists is to be fixed according to the net income from the crops raised each year and should be treated as a regular expenditure of the society before working out its annual profit and loss account. Another important change in the bye-laws makes provision to enable the colonists to leave the society on certain conditions if they are obliged to do so before the stipulated period of five years.

Just before starting the scheme, a small committee was appointed by the University to work out the details of the cropping etc. The committee included experts like Rao Bahadur M. R. Ramaswami Sivan, Nawabzada Saadat Ullah Khan, Deputy Director of Agriculture, Mr. R. N. K Sundaram, Assistant Director of Agriculture and a few others. They prepared an estimate for equipping a farm of 100 acres with live and deadstock and also a cropping scheme. According to their scheme each colonist is to be allotted 8 acres of wet lands and 2 acres of garden lands.

Working of the scheme. The actual work was started in June 1938. The two colonists who were non-agricultural graduates were given a fortnight's training at the Palur Agricultural Research Station. Their farm was equipped with four pairs of cattle costing Rs. 225, a few country ploughs and tools like mammatties and sickles at a total cost of about Rs. 46. An area of 18·65 acres of wet lands and 1·50 acres of dry lands was cultivated during the first year. Paddy followed by black and green grams were the

crops raised in the wet lands. Tobacco, groundnut, vegetables, fodder cholam and plantains were the important crops in the irrigated dry lands. Two permanent coolies were engaged by the colonists to help them. The department of Agriculture provided them with a maistry for help in their day to day routine. The local Agricultural Demonstrator was instructed to visit the colony periodically and render them all possible help. (The statement of receipts and expenditure extracted from the audit report for 1938—39 is given in Appendix A. A similar statement for 1939—40 is given as appendix B.)

Results of two years work. It may be too soon to judge the ultimate success or failure of the scheme from the results of the past two years. In the first year the society incurred a loss of Rs. 350. This is due to various causes. The wet land that was available for cultivation had been lying uncultivated for a number of years before allotting it to the colonists. It was overgrown with *babool* trees and shrubs of various kinds. These had to be uprooted and removed and a lot of earth work had to be done before levelling the land and bringing it into a fit condition for cultivation. The colonists began the work late in the season, no cattle manure was available for purchase and the crops had to be raised without any manure. Paddy therefore raised in 18·65 acres gave a poor yield of 1260 lb. per acre. Black and green grams had also showed a poor stand. Among the garden crops, tobacco and tomato did well and brought in some profit. Due to the absence of rains, dry groundnuts failed. A perusal of the accounts shows however that the results of the second year were encouraging. But the accounts included the subsist nce allowance granted to each colonist at Rs. 15 per month and the expenditure on live and deadstock and the permanent improvements. Deducting all these and allowing for depreciation on the live and deadstock, there was a gain of Rs. 298—13—2 against a loss of Rs 357 15 0 in the previous year. Thus the colonists were able to get an average monthly income of Rs. 27—10 each, from a total area of 32 acres of wet lands and about 1·50 acres of garden lands It is true that such a poor income will not attract more colonists and may even puzzle the sympathetic critics.

Difficulties met with in working Since the University could not finance the scheme, the society had not enough funds for the purchase of manures etc. in time and to do the agricultural operations as advised by the Agricultural officers. The encouraging results of the second year were mainly due to the adoption of two simple improvements viz. thin nurseries and economic planting. To get better returns, money crops have to be grown in the garden lands extensively. Unfortunately the water in the ponds dug in the garden lands was brackish and the crop did not come up well. To give a convincing example, 200 plantains in that area were irrigated with the pond water while a similar number was left unirrigated. Within 2 or 3 months, all the irrigated plantains died while the unirrigated ones survived and are at present yielding. The University was approached

again after about $1\frac{1}{2}$ years, detailing all the experiences gained so far. The Vice-chancellor and the other executive officers have been watching the progress of the scheme from its inception and have now come forward to help the society by giving an advance of Rs. 700 every year to be repayable at the end of the season. They have also recently sanctioned a fairly large sum to build residential quarters, cattle shed, store room etc. for the benefit of the colonists. The Director of Agriculture when he recently visited the colony suggested the diversion of fresh water from a drainage channel nearby, to irrigate the garden lands. This scheme is being investigated by the Engineering staff of the University. If it materialises, definitely better results, comparable to those of the Punjab schems, can be expected. A beginning has also been made to cultivate sugarcane in a portion of the wet lands. The stand of the present crop is good. The results of the second year have been a definite advance over those of the first year. Since the University has come forward to advance the required amount to meet the cultivation expenses, it would be possible to cultivate the crops systematically and adopt the improvements advocated by the department to a greater extent than in the previous years. There is therefore no ground to doubt the stability of the scheme in the future.

An appeal to Agricultural graduates. The Scheme is the first of its kind in Madras and is a unique venture started mainly through the untiring efforts of Sri Rao Bahadur M. R. Ramaswami Sivan, ex-Principal of the Agricultural College. As the two colonists who offered to work the scheme were non-agricultural graduates, they had to seek and obtain far more technical help than would have been necessary, if agricultural graduates had offered themselves to work the scheme. It is a pity and an irony that agricultural graduates failed to respond to work a pioneer scheme of this kind for which they were most fitted by training. The society is prepared to admit a few more colonists and it is hoped that a few ex-students of this Agricultural College, would come forward to work the scheme more successfully and demonstrate to other educated men that farming, if done on scientific lines is always a paying proposition. They would thus enhance the reputation of their *Alma Mater* and prove to the outside world that a degree in agriculture counts in life's struggle and enables one to make a decent living, even under depressing circumstances.

Acknowledgements. I take this opportunity to acknowledge the help given by the colonists and the officers of the University by furnishing me with the relevent particulars and figures needed for this note.

STATEMENT A.

Receipts and Expenditure during 1938—39.

Expenditure.

			Rs. a. p.
I. Expenditure on permanent improvements to be done by the University.			**83 6 7**
II. *Capital Expenditure.*			
Livestock	**221 9 0**		
Deadstock	**90 11 0**		
	312 4 0		**312 4 0**

III. Kist paid by the University			114 0 0
IV. *Working expenditure in cash and in kind.*			
Seeds and plants	76 0 10		
Manures	30 7 6		
Cooly labour	458 0 2		
Maintenance of cattle	156 2 10		
Miscellaneous cultivation expenses	15 5 0		
Subsistance allowance to the two colonists both in cash and in kind	390 0 0		1,126 0 4
Grand total			1,635 10 11

Receipts.

By sale of vegetables	36 9 0	
,, milk to the colonists	29 12 0	
By value of green gram	19 8 3	
,, black gram	7 0 0	
,, groundnut	5 3 0	
,, straw	81 0 0	
,, tobacco	60 0 0	
,, paddy	600 14 6	
Donation in cash and kind	117 4 0	957 3 6

STATEMENT B.

Receipts and Expenditure during 1939—40.

Expenditure.

1. Expenditure on Permanent Improvements to be borne by the University.			27 2 6
II. *Capital Expenditure.*			
Livestock	47 0 0		
Deadstock	70 1 9		
	117 1 9		117 1 9
III Kist on the lands paid by the University			200 0 0
IV. *Working expenses.*			
Seeds and plants	91 12 10		
Manures and chemicals	35 0 0		
Wages of labour	579 9 6		
Maintenance of cattle	133 11 7		
Miscellaneous cultivation expenses	25 11 7		
Subsistance allowance to the two colonists	364 10 7		
	1230 8 1		1230 8 1
		Total	1574 12 4

Receipts.

By sale of milk to the colonists	30 0 0	
,, vegetables	32 11 9	
,, plantains	4 4 5	
,, paddy seedlings	25 10 0	
,, groundnut	1 4 9	
,, straw	5 0 0	
By value of 2 kalams and 3 marakals of blackgram at Rs. 5—0—0 per kalam.	11 4 0	
,, 34 kalams and 3 marakals of green gram at Rs. 3—4—0 per kalam	111 5 0	

By value of 233 kalams and 5 marakals of Adt. 2 and 8 paddy at Rs. 2 per kalam	466 14 0	
,, 560 kalams of Adt. 17 and PLR 1 paddy at Rs. 1—12—0 per kalam	980 0 0	
,, 800 bundles of straw at 6 per rupee	133 8 0	
,, tobacco	26 3 9	
	1828 1 8	1828 1 8

STATEMENT C.

Profit and loss statement.

Details.		Sub-total.	Total.
1938—39.		Rs. A. P.	Rs. A. P.
Share of permanent improvement 10%		8 5 5	
Depreciation on livestock 25%		55 9 9	
,, deadstock 12%		11 3 0	
Kist paid by the University		114 0 0	
Working expenses as in statement A		1126 0 4	1315 2 6
Less receipts as in statement A			957 3 6
Net loss			357 15 0
1939—40.			
Receipt as in statement B.			1828 1 8
Expenditure:			
Share of permanent improvement			
1938—39	8 5 5		
1939—40	2 12 0	11 1 5	
Depreciation on livestock 25%			
1938—39	55 9 9		
1939—40	11 12 3	67 5 9	
Depreciation on deadstock 12%			
1938—39	11 3 0		
1939—40	8 12 3	20 5 3	
Kist paid by the University		200 0 0	
Working expenses as in statement B		1230 8 1	1529 4 6
Net expected gain			298 13 2
Average monthly income per colonist.			
Subsistance allowance given to the two colonists		364 10 7	
Net expected gain		298 13 2	
		663 7 9	
Average monthly income	$\frac{663\ 7\ 9}{2 \times 12}$	27 10 3	

Skew Bolls in Cotton.

By L. NEELAKANTAN, M. A,

Assistant to Cotton Specialist, Koilpatti.

Introduction. In 1939-40 a few cotton bolls were observed in a bulk field of K. 1 (a strain of *Gossypium arboreum* L., var *neglectum* forma *indica*, evolved at the Agricultural Research Station, Koilpatti) which differed from the normal in displaying a characteristic skewness in their external configuration. Examination of these skew bolls revealed that some of the ovules had not developed. These defunct ovules reduce the potential yield of the cotton plant, and thus cause an economic loss. A similar observation was made by the writer in N 14 (another strain of *Gossypium arboreum* L., var. *neglectum* forma *indica)* at the Agricultural Research Station, Nandyal in 1938-39.

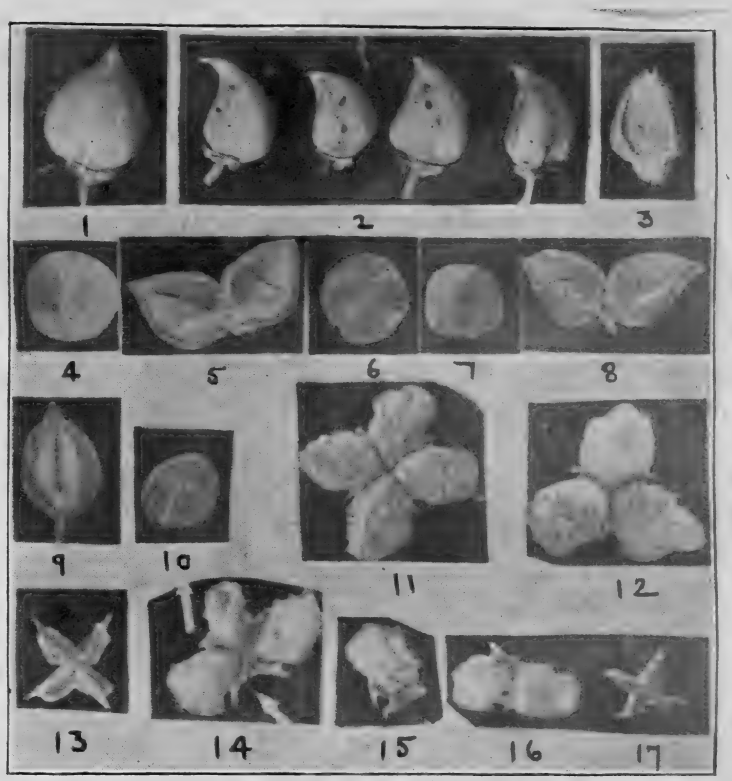
Investigations into the nature and causes of such an intensely localised non-development of ovules, its relation to boll shedding and its seasonal and varietal peculiarities were commenced at the Agricultural Research Station, Koilpatti, in 1939-40. A few interesting conclusions were arrived at in regard to the origin of skewness.

Observations. Uniformity in the development of all the ovules situated in a line in the multilocular ovary of the cotton boll appears to be a necessary condition for determining its shape and symmetry. It is found that the occurrence of a few undeveloped ovules at random in a mature boll does not cause any change in shape, but their presence in a series alters it. (Plate I figs. 1—17).

In fig. 1—3 are shown a normal boll, some skew bolls and a skew boll dissected exposing two locules with suppressed ovules. Fig. 4—10 show the internal morphology of a normal, and a skew boll. Dehisced fruits of normal and skew bolls are shown in fig. 11—17.

Skewness becomes visible when the boll is about a week old, and persists till maturity. The suppression of the ovules takes place commonly in one or two locules and occasionally in three. In all cases the ovary wall opposite the functionless ovules is atrophied, due possibly to the absence of the internal pressure generally developing in a normal locule with growing seeds. The wall is soft to the touch, and yields to gentle pressure testifying to the hollowness inside.

The skew boll is not the result of insect or fungoid disease ; neither is it a freak. Its occurrence is fairly common. Random examination of 897 bolls in a bulk crop of K. 1 on a single day prior to the commencement of bursting showed that 30 bolls were skew (3·4%). The percentage was more in bolls from selfed plants. Eighty-eight out of 1,185 selfed bolls examined on the same day were skew bolls (7·4%). When classified according to



SKEW BOLLS IN COTTON

Figs. 1—17. 1. Normal boll; 2. Skew bolls; 3. Skew boll cut longitudinally; 4. Normal boll; 5. Normal boll split lengthwise; 6. Same cut across; 7. Skew boll; 8. Same split lengthwise; 9. Skew boll with aborted locule exposed; 10. Skew boll cut across; 11. Four-loculed normal boll; 12. Same three-loculed; 13. Normal four-loculed boll with kappas removed; 14. Four-loculed boll with one locule abortive; 15. Four-loculed boll with three locules aborted; 16. Three-loculed boll with one locule aborted. 17. Four-loculed skew boll with kappas removed.

locular composition it was noticed that the skew bolls were more in four-loculed bolls (10·3%) than in tri-locular bolls (3·8%). Cotton flowers are found to exhibit variations in contabescence from complete sterility of the androecium to degrees of sectorial contabescence A hundred flowers with perfect anthers, a hundred with anthers showing sectorial contabescence and fifty flowers with complete sterility of anthers (practically pistillate) were at the time of flower opening tagged during mid-flowering season for study of the morphology of boll shape. Care was taken to see that the flowers were not unduly shaken while tagging. All the 39 bolls that developed from the first set of flowers were normal in shape. Out of 28 bolls that matured in the second set, six (21·4%) were skew. In the third set only seven bolls developed of which two (28·6%) were skew.

Experiments. A more definite evidence was obtained in an experiment on artificial pollination. Pollen grains were gathered on the hairy margins of torn off leaf bits and dusted on the lower regions of the stigma of emasculated flowers on the day of flowering at about 11 a. m., when the stigma was highly receptive. The pollen grains were then carefully distributed thinly and evenly on some of the stigmatic faces, while on others, no grains were left. With a powerful hand lens the number of grains thus deposited were counted and the lobes that had not received any pollen were also checked. A faint pin scratch was made across the line of dehiscence of the dusted lobe with the object of creating a permanent scar to facilitate identification later. The dusted flowers were enclosed in paper bags which were fastened in such a way as to avoid the possibility of the stigma rubbing against the paper. The stigmas were re-examined next morning to make sure that no pollen had strayed to the non-pollinated lobes.

Flowers in which all the stigmatic lobes were dusted, developed normal bolls, but those with a few lobes pollinated grew into skew bolls. It was therefore apparent that the pollen tubes developing from grains deposited low on the stigmatic lobes travelled down straight, entered the corresponding locule, and fertilised the ovules inside. The ovules in the other chambers did not get any pollen tubes and remained unfertilised causing skewness in the developing boll.

Discussion. A similar observation on the pollen tubes was made by Doak (1937) in a study on pistil anatomy in relation to experimental control of fertilisation. He remarks that though the arrangement of the pistil tissue "does not preclude the possibility of pollen tubes switching from the stigma of one carpel to the ovules of another during descent it is such as to disfavour this transfer. This is especially true of tubes grown from points low on the stigmatic lobes".

In the field, the stigma in the flower of K. 1 is well above the staminal column and the first part to get pollinated automatically is the basal region. Insects and wind tend to distribute pollen further up later in the day. Such a type of distribution is not possible in flowers which are selfed. Examination of 700 flowers on a single day in K. 1 bulk during mid-flowering

showed that 8 per cent were fully contabescent. These invariably shed when selfed. About 22 per cent were sectorially contabescent. In these flowers the stigmatic lobes near the contabescent portions of the androecium have no chance of self-pollination. But insects crawling about the stigma unwittingly effect a scattering of the available pollen all over, and thus will counteract the tendency towards skewness. In the absence of such an agency such flowers develop skew bolls On selfing, the sectorially contabescent flowers produce skew bolls invariably. Thus, while skewness is facultative in open pollinated flowers it is obligate in selfed flowers. It is not improbable that the 3·4 per cent of skew bolls observed in nature is due to the fact that the flowers from which they matured are all sectorially contabescent and are not visited by insects. The selfed flowers suffer from a disadvantage in that the contabescent flowers do not have a chance of pollination by insects. This may account for the numerical preponderance of skew bolls from selfed flowers over those from open pollinated flowers. The conclusion drawn is that skewness is brought about by the non fertilisation of ovules in particular locules.

Further studies into the causes of the skewness are in progress and their results will be discussed in another paper.

Acknowledgments. This study was first undertaken at the Agricultural Research Station, Nandyal during 1938—39 and continued at Kovilpatti. My thanks are due to Messrs R. Swami Rao and R. Chockalingam Pillai, Asst. Director of Agriculture, Kurnool and Thirunelveli respectively for permitting me to undertake this investigation and to Mr. V. T. Subbiah Mudaliar for his kind suggestions and criticisms during the preparation of this paper.

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Palmyra Fibre Industry.

By A. SANKARAM, B. Sc. (Ag.)

Introduction. In many of the villages of the Vizagapatam district extraction of palmyra fibre is an important cottage industry. The industry is fairly an old one. As a typical cottage industry it provides sufficient employment to the ryot during his spare time and supplements his income from cultivation. Of the different sources of brush fibre, the palmyra palm is easily the cheapest as it grows extensively on waste dry lands and on many field bunds. The technique of extraction is simple and does not involve the use of any costly appliances.

Narasimham (1) has dealt about the industry with special reference to Golukonda taluk of the Vizagapatam district. In the present article an account of the different phases of the industry is given, with particular reference to the economic aspect. The industry is mostly concentrated on

the east coast of the Presidency. The three districts, viz., Vizagapatam, East and West Godavaries, chiefly supply the raw material to the several factories located along the coast. The supplies are more or less regular throughout the year, but usually there is a slight increase during the dry months :— i. e. December to June. It is only during this period that a ryot can take it up as a side industry without prejudice to his main occupation.

Extraction of fibre. Leaf sheaths (basal portion of the leaf stalks) of palmyra palm trees are cut in lengths varying from 20 to 25 inches. They are split into two and the sharp edges and the thin layer of the inner side are removed. The portion remaining is beaten while it is wet with a wooden hammer on a hard floor, until the fibres get separated. They are then combed through sharp tines fixed to a flat wooden plank in two alternating rows of six each. The preliminary combing is not perfect as a part of the non-fibrous material still adheres to the fibres. The combed stuff is next bundled and taken to weekly shandies for sale.

Preparation for the factory. The local dealer who purchases this crude stuff gets it thoroughly cleaned, combed and dried in the sun. It is next graded into two classes—the thick black and the thin brown. Each class is separately made up into small bundles of 2 to 2½ inches in diameter. The material is then ready for transport to the factory.

The process at the factory. The material received at the factory is subjected to a lengthy process before it is made ready for export to foreign countries. Preparation of dye solution* is an important item in the whole process. There are different dyes used by different factories, but in main all the factories use a mixture of Cutch (an inferior variety of catechu), Congo red (a patent dye preparation), and Myrobolan (*Terminalia chebula*). The fibre is then steeped in an iron receptacle, containing the dye and boiled for about 12 hours. The stuff is then removed and heaped on the floor. It is allowed to remain for about 3 to 4 days, in that state, without any further treatment. During this period the fibres absorb the dye. Finally they are dried and bundled.

The bundles are then heaped up in a circular fashion on a floor. The individual fibres are then graded according to their length, combed, bundled, weighed and packed into bales each weighing one cwt., for export.

Export. There is a good demand for the palmyra fibre in foreign countries especially England, Denmark, Japan and France. The standard specifications are fixed by the foreign buyers with reference to the length and thickness of the fibre. The material for export is prepared accordingly. It must be noted that all the material produced has to be exported, as there is no demand for the product in this country.

* Fourteen lbs. of Congo red and 14 lbs. of Myrobolan are added to 100 lbs. of water and thoroughly mixed, the undissolved portions being left in the solution itself. To the above solution are added 2 to 5 tolas of Cutch and about ½ lb. of washing soda.

Quality of the fibre. There appears to be a good deal of variation in the quality of fibre supplied to the factory. This is mainly due to the age and varietal differences of the tree, the soil in which it grows, the method of extraction adopted etc. The longer and thicker the fibre the better the value. An ideal fibre should possess the following qualities :—

1.	Colour.	Black.
2.	Size.	16" to 18" long (fairly thick).
3.	Cleanliness.	Should be free from all extraneous matter.
4.	Moisture.	Completely sun and air dried.
5.	Condition.	Free from all fungus growth.

Labour and wages. The industry gives employment to a large number of labourers, mostly women. Wages are usually paid mostly on a contract basis according to the nature and amount of work turned out. For sorting, sizing and combing of the fibre women are employed who are paid 10 to 14 annas per cwt., according to the quality of the fibre sorted out. A woman can turn out one cwt. of the finished material in about $1\frac{1}{2}$ to 2 days. On an average she earns Rs. 10 per month. All wages are paid in cash only. There are no fixed hours for the women coolies but they do their work in their leisure hours.

Possibilities of a side industry. During December to May, there is very little work to be done on dry lands Agriculturists and labourers depending on such lands for their livelihood can profitably engage themselves by taking this industry, as a subsidiary occupation. They can take on lease the palmyra palm trees, cut the leaf sheaths, extract the fibre and sell the stuff in the nearest *shandy* where there is a market. On a modest estimate, a family with two adult members can extract 1,200 to 1,500 lb. of fibre in one year which will fetch about Rs. 24/- to Rs 30/-. Deducting one-fourth as the lease amount, the balance can be taken as the net gain. It may, however be stated that considering the profits earned by the middlemen and the factory owners, the remuneration received by the primary producers is very inadequate. From the view point of the primary producer, the industry provides him with some kind of work for his leisure hours and a small source of income in cash.

Acknowledgement. I wish to take this opportunity to express my grateful thanks to Sri T. Nataraj, B.A., B.Sc (Ag) for his constructive criticism and valuable suggestions on the paper.

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SELECTED ARTICLE

The Preparation, Sowing and Care of Cigarette Tobacco Seed Beds.

By W. M. ROGERS,

Tobacco Officer.

It is of the utmost importance that proper care should be taken of seed beds, in order to produce a successful crop of tobacco. No detail should be overlooked and no operation imperfectly done in raising the young plants to the planting out stage. For the successful growing of a uniform crop of tobacco, every endeavour should be made to obtain uniformity in size and strength of the seedlings to be transplanted. The site selected should be a well-drained land, close to a permanent supply of water. The same site should be used only one year and then rested at least for two years The site should be away from big trees which have extensive root systems and too much shade. An eastern or north-eastern exposure is best, as the early morning sunshine is very desirable for the plants.

The seed beds should have an abundance of available plant food at the time the seed germinates and a sufficient supply to maintain steady growth of the seedlings during the period they remain in the beds First of all the site should be cleared of weeds and rubbish. The area cleared should be in excess of the actual area required for the nurseries. Then the land should be ploughed once, about a month before the actual nursery operations begin. After the first ploughing a fairly heavy dressing of well-rotted farm-yard manure should be broadcasted evenly and the area ploughed again some time before the final operations commence. After this the site should be well levelled and eventually lined off into beds with broad shallow drains between the beds to serve as pathways. Fairly deep open drains should also be cut around the four sides of the site.

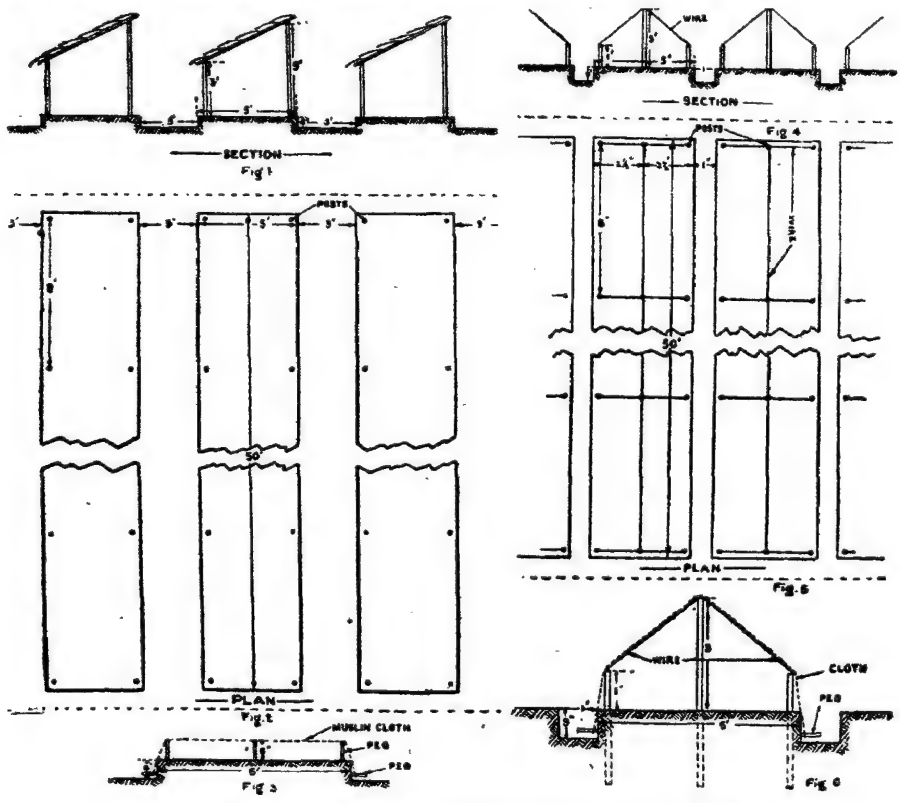
It has been found very convenient to carry on operations and handle plants in beds which are 5 feet wide and 50 feet long with a shallow drain 3 feet wide between the beds.

On opening the pathways between the beds the top-soil should be thrown on the beds. Each bed should then be brought into fine tilth and properly levelled prior to being sterilized. If the soil is too dry it is essential to water the beds and then work the soil into a fine tilth with weeding forks.

The beds should be well sterilized to a depth of 3 inches by the open fire method. This will destroy the seeds of weeds and also kill the destructive organisms inhabiting the soil. The burning should be done when there is no wind blowing, so that full benefit may be derived from the heat generated by the burning material. The beds are well sterilized by burning maize stumps, sunnhemp stumps or brush-wood and coconut husks placed in sufficient quantities to sterilize the soil to a depth of about 3 inches. Tobacco stalks should on no account be used for sterilizing mainly for the reason that diseased portions of leaves may be left about on the site and infection of the young plants may result. When the beds are properly sterilized the soil will be of light brick-red colour and will be very friable and easily pulverized. To clear any doubts as to the depth to which the soil has been sterilized by the fire, a very simple test can be made by burying a potato about 3 inches below the surface of the soil in the

seed bed before burning and if the potato has been well cooked and the skin peels easily, then the soil has been sterilized.

After the beds have cooled, a fertilizer mixture made up of ½ lb. of nitrate of soda, ½ lb. of sulphate of potash and 1 lb. of super phosphate is spread over each ten square yards of seed bed. This should be lightly dug in, taking care not to bring to the surface any unsterilized sub-soil, the fertilizers and residual ash being thoroughly mixed with the surface soil. The seed beds are now reduced to fine tilth and properly levelled with a hand rake. Now the beds are ready for sowing. Most growers still make the mistake of sowing their beds too thickly. Such beds produce delicate and tall plants unsuitable for transplanting. Good and healthy seedlings will be obtained when an ounce of properly cleaned seed is sown in an area of 100 square yards, which should produce enough transplants for 5 acres of field. To secure even distrubution of seed it should be mixed with wood ash, a teaspoonful of seed being mixed with a quart of ash, and sown in a seed bed 50 ft. by 5 ft. This mixture should not be sown in one effort and it is very much better to go over the bed 4 or 5 times to secure an even distribution. If wood ash is not available, light white sand may be used. Sow the seed very carefully, gently press the seed into the soil with a smooth hand board 16 in long and 8 in. wide into which a handle is fixed. Water the bed lightly with a can fitted with a fine perforated rose. The seed beds should be roofed over with movable cadjans supported on a frame of sticks driven into the ground and tied together. The roofs should be about 5 feet high to allow of watering, weeding and spraying being easily carried out.



Plan and section of Virginia tobacco nurseries.

—*Tropical Agriculturist.*

To obtain a uniform germination of seed the beds should be watered regularly during the early mornings, late in the afternoons and, in very hot weather, at any time they show signs of drying off. The beds should be kept moist at all times, but not wet.

According to the area to be transplanted and the size of flue barn and owing to the uncertainty of weather conditions it is necessary to have plenty of seedlings available for a period of at least 8 weeks. It is therefore necessary to have at least 5 or 6 sowings at intervals of 4 or 6 days and to sow at least 4 or 5 times more than required. It is probable that about 30,000 seeds (one teaspoonful) are sown in one bed 50 feet by 5 feet in area, but it is not advisable to count on being able to draw more than 7,000 plants from this area. If germination has been good and when seedlings are about 3 weeks old thinning out should be done. Over-crowding in the bed will produce weak plants. The beds should be covered during the night with cheap muslin cloth to keep off insects. The beds should also be kept free from weeds. Experiments have been carrried out during the past *maha* and present *yala* of growing tobacco seed without cadjan coverings but using a cheap white calico cloth and covering the beds as illustrated. The cloth is sufficiently strong to carry off heavy rains and is stretched across the wires and pegged down at ends and sides of beds at intervals of about 4 to 5 feet. The experiment, which is being continued, so far is proving reasonably satisfactory.

In order to guard against pests and diseases the beds should be sprayed weekly when the leaves of seedlings have attained the size of one's finger-nail with the following mixtures recommended by the Mycological and the Entomological Divisions of the Department of Agriculture (Ceylon).

First two sprayings:—
¼ oz. lead arsenate
1 oz. Bouisol colloidal copper
1/8 oz. Agral
in one gallon of water.

When the plants are fairly big the following mixture may be used:—

½ oz. Lead Arsenate
1 oz. Bouisol Colloidal Copper
1/8 oz. Agral
in one gallon of water.

The spraying should be continued up to the time of transplanting.

During the early stages of growth of the seedlings, the cadjan roof should remain over the beds all day.

The hardening of plants should commence when the plants are about half an inch in height. When the plants come to this height, remove the covers daily during the morning for a few hours, increasing the daily period of exposure until the plants have hardened sufficiently to be left open all day long with no bad effects. Care should be taken not to expose the plants to heavy rains Plants are ready for transplanting in six to eight weeks. The best way to test if a plant is fit for transplanting is by bending it; if it breaks with a snap then the plant was suitable for transplanting. Before pulling the plants water the beds thoroughly and pull plant by plant taking care to pull only the strongest and the healthiest ones. Pack them carefully in baskets and despatch them to the field for transplanting.—*Tropical Agriculturist*, 94 (1940): 365—368.

ABSTRACTS.

Planned Soil Conservation Work in Puerto Rico. *Soil Conservation.* 6 : (1940).

The area of Puerto Rico including the dependant islands is about 3400 square miles and the population about 1·7 millions. With 506·8 people per square mile, she has an average of only 0·48 acre of arable land per head. Eighty percent of the population depend directly or indirectly on agriculture. Though the average size of a holding is about 36 acres, 84 per cent of the holdings are less than this size. Almost all the most important cultivated plants such as sugarcane, coffee, bananas, grape-fruits and cocoanuts are exotic to the island. Farming on steep slopes for several hundred years has brought with it great erosional losses of the soil. In 1935, the Soil Conservation Service made an erosional survey which indicated, the type of soil. the extent of erosion and degree of slope. After a study of conditions of soil and slope along with some of the engineering and agronomic limitations so imposed, eight groupings were made defining the physical characteristics and the recommendations made for preventing soil erosion. For instance in Group I are included slopes of over 1 in 3 and where considering the texture of the soil, there is a possibility of over 75 per cent of the top soil being removed. Crop cultivation is not considered practical for such conditions and instead, their development into pasture or forest is recommended. In Group II, slopes of 1 in 4·5 to 1 in 7·5 are included with a possibility of 25 to 75 per cent of the top soil being removed. Here retirement to pasture or forest is ideal. Considering however the pressure on land, a two-year or longer crop rotation has been established. Tobacco, sweet potatoes, beans, vegetables, and grasses are recommended in conjunction with the regular planting of leguminous green manure crops. Similar recommendations appropriate to the soil conditions and slopes prevailing elsewhere have also been formulated. Two soil conservation Experiment Stations are at work. The one at Mayaguez is engaged in determining the type of grass best adapted for blank cover and finding a food crop that could be grown on these banks in place of the grass cover. (2) Development of a cheaper method of building bench terraces than the band construction method. (3) Determining the relative values of different types of vegetation, and estimating the erodibility of fallow land and sub-soil. The second Experiment Station at Rio Piedras is making detailed studies of the root systems crown and growth characteristics of grasses. In co-operation with other institutions in the island, detailed experiments relating to the analyses of grasses as to their nutritional value and digestive qualities and a study of the erodibility of soils as related to their chemical and physical characteristics are on hand It has been found that sweet potatoes were the best of the cultivated crops as compared with various beans to prevent soil erosion to any large extent. Guinea and molasses grasses showed more erosion than any of the cultivated crops such as cane, beans or sweet potatoes. Planting sugarcane in furrows as against the old method of planting in holes was found to entail less of erosion. Trailing indigo (*Indigofera endecaphylla*) is very promising as an erosion control plant because of its numerous roots along both nodes and internodes and because of its dense mat of stems and leaves. R. R.

Seed Disinfection. *Dillon Weston, W. A. R. and C. C. Brest—Nature* 145 (1940) : 824. Certain proprietory seed disinfectants and protectives which contain organo-mercury compounds as their fungicidal basis are now used for disinfecting seed before sowing. When correctly used they control many seed-borne diseases. In these seed disinfectants the fungicidal salt is often a member of the series

R. Hg X, where R is a hydro-carbon and X an acidic radical. There is a close relationship between composition and fungicidal power' the toxicity decreasing with the increase of the molecule R. If these salts are applied to, and held by, the grain in over-doses, phytocidal effects are produced. The seed may be killed outright or even if it germinates, further development is abnormal. The tissues of the coleoptile are thickened and roots are stunted. Cell division is inhibited. the existing cells becoming enlarged and multinucleate, either with small nuclei or with large ' giant nuclei ' which are polyploid. It has been found that if the grain shows high initial germination and is superficially dry when dusted, no injury to the grain is likely to result. If such seed has to be stored it should be kept under dry cool conditions with adequate ventilation and no loss of germination is likely to happen for several months. The most important factor that should be noted is the relative superficial moisture of the seed, since such seeds will retain excessive quantities of dust and thus affect germination.

T. S. R.

A New Method for Controlling Irrigation. *Michigan Agr. Experi. Stations Tech. Bulletin* 172.

The apparatus gives a continuous measurement of soil moisture in sites under field conditions without disturbing either the plant or the soil. A continuous measure of soil moisture at various depths reveals the actual moisture conditions at any time thus enabling the practice of a more efficient and economical irrigation. The apparatus consists of an absorption block about the size of a small match box which is buried at any desired depth in the soil. Two insulated wire leads, connect this block to a specially devised portable instrument (a special form of Wheatstone bridge) which measures the electrical resistance of the block. Since the blocks are porous they readily take up moisture from the soil. As the soil dries out the block loses moisture so that changes in soil moistures are followed by changes in block moisture. Further more, the electrical resistance of the block changes in proportion to its moisture content. Hence a change in soil moisture is measured by a change in the electrical resistance of the absorption block. Many absorption blocks can be distributed over the growing area at different depths to provide numerous points of measurement. The use of the new method is simple, no particular skill being required. By means of earphones the resistance of the absorption block may be determined in 20 or 30 seconds.

M. K.

Grass Storage in Rainy Regions. Sethi R L. *Indian Farming* 1 (1940).

Grass grows so abundantly during the rainy season, generally in surplus of actual requirements. One way to utilise the surplus and thereby solve the fodder problem would be to conserve it for use later when fodder is scarce. Grass can be stored in two ways (i) by making hay and (ii) by ensilage. But since, due to the wet weather hay making is difficult, the second method of storage is held to be perhaps the only way for heavy rainfall areas. Ensilaging is not appreciated in the areas where rainfall is light because in the first place surplus grass or green fodder is not available in sufficient quantities for conversion into silage and secondly, due to the bright weather in such areas hay making which unlike silage does not entail any loss of material, is preferred. The following is a summary of the cost of producing silage in different localities.

Place.	Cost of production per 100 lb	Percentage loss.	Remarks.
1. Bombay		15 to 34	1. The cost of production depends on the cost price of the material ensiled and the wages paid to the labour employed.
2. Madras			
a) Pattambi farm	As. 3	30 to 33	
b) Nandyal „	„ 8	27	
c) Taliparamba „	As. 1½ to 6	22 to 50	
3. Surat farm		4 to 17 in Jowar. Cholam and 17 to 35 in grass	2. The loss in soil seems to vary in different places according to the type of silo and the amount of moisture present in the material ensiled.
4. Tegur farm (Bombay)		5 to 10	
5. Assam		20 to 40	
6. Sind		30	
7. South Thana (Bombay)	As. 9		
8. C. P.	less than 1 anna to 6 annas		
9. N. W. F. P.	As. 6¾ to As. 8		

M. K.

Forcing Mango Trees to Bear Regularly. Lal Singh and Abdul Aziz Khan. *Indian Farming* 1 (1940).

The bearing habit of the mango tree in alternate years is so regular that the "off" and the "on" years can be anticipated almost with certainty, unless of course, it is altered by some unforeseen circumstances such as unfavourable climatic conditions—frost, hailstorm or untimely rain at flowering or some disease or pest. Unlike many other fruit trees the growth in mango is periodic rather than continuous i. e, successive periods of growth alternate with periods of rest. The number of these periodic growths or 'flushes" occuring during the growing season in a year as well as the dates on which they occur and the period over which they extend varies with the variety, climatic conditions cultural practices, age of the tree and the amount of fruit borne by the tree. Growth occurs practically during each month commencing from April and ending with August, and as many as five flushes may be produced during the growing season. The fruit is borne of flower panicles which come out in spring from the terminal ends of the shoots that have grown during the preceding season. The chief points observed are: (a) Usually more shoots appeared in April, May and June flushes than in July and August flushes. (b) The April flushing shoots, fruited in greater number in the following year than the remaining four flushes. This information throws some light on the importance of inducing the tree to produce more shoots earlier in the growing season by modifying the cultural practices (c) Shoots of the same flush did not stop growing at the same time. Some of them ceased growing much earlier than others. The shoots that did not stop growing earlier remained unfruitful in the following year. The wood of the shoots growing and stopping earlier becomes hard and mature and this is very necessary for fruiting. In localities of heavy rainfall the best crop of mangoes

follows a monsoon that closes completely fairly early in the season, provided the crop is not damaged by any other cause. If the monsoon is prolonged, the shoots continue growing late with the result that the wood remains tender and immature and the tree is generally unfruitful in the following year. This observation is confirmed by the successful results obtained by (i) ringing and root pruning the over-vegetative unproductive trees and (ii) by the use of dwarfing root stocks in the case of vigorous growing varieties. Dry summers provided moisture is not a limiting factor, are more conducive to fruiting in the following season than wet summers. All these practices and conditions have the same influence on tree growth in so far as they retard the vegetative growth and induce it to stop earlier. Shoots that flower in one season did not flower at all or flowered in very small numbers in the following year, showing a tendency to bear in alternate years. Therefore, it stands to reason that if, by proper cultural practices, enough shoots are induced to grow along with fruiting in the same year it should be possible to remedy the biennial bearing habit in mangoes and get a regular crop year after year. In years of excessive flowering or fruiting it should be possible to induce vegetative growth also in the tree by partial deblossoming (i. e. removing flower panicles from a certain number of shoots) and thereby bringing about fruiting in the following year. M. K.

A study of coconut seed selection for germination. *Umali D. L. Phil. Agriculturist*, 29 (1940) 296—312.

Thin-husked nuts with an average of 2·9 cm. (thickness of husk) and below germinated earlier and produced more seedlings with more leaves and roots than thick-husked nuts of 3·0 cm. (thickness of husk) and above. Seedlings grown from nuts with a setting percentage of 35·5 per bunch and above germinated earlier and gave a higher percentage of germination. The seedlings produced had more leaves and longer roots than those from nuts obtained from bunches of a low percentage of setting, 18·5 and below. Nuts gathered from heavy bunches of ten or more likewise germinated earlier and produced seedlings which were taller, heavier, and with a much better root system than those from light bunches. The nuts from bunches with a high percentage of female flowerbearing rachillae (50·5 or more) required less time to germinate and produced slightly taller seedlings than those from bunches with a low percentage. Although the lengths of the roots in the two treatments were practically the same, the seedlings in the latter produced less roots and leaves than those in the former. Light nuts weighing 0·95 to 1·35 kilograms germinated much later than heavy nuts (1·85 to 2·45 kilograms) and produced shorter seedlings with less roots and leaves. The position of the nuts on the bunch, such as on the ventral and dorsal sides, had no influence on the time and percentage of germination. The seedlings of nuts from the dorsal side produced more leaves and were heavier than those from the ventral. The seedlings from the ventral side, however, were taller and developed more roots than those from the other lot. The seedlings from the top nuts produced more leaves and roots than those from the bottom. The middle nuts required less days to germinate but gave a much lower percentage of germination than either the top or the bottom. (Author's abstract)

EXTRACTS.

The Coconut Industry.

In the latter half of 1939 the Hon. Maximo M. Kalaw, a member of the National Assembly of the Philippine Islands, accompanied by his technical adviser Mr. Hilarion G. Henares, undertook a special mission abroad to investigate the methods of cultivation, treatment, and marketing of coconut products in coconut producing countries as well as the conditions affecting them in the

principal markets of the world. This report is of special interest to those connected with the coconut industry in all countries in view of the very serious situation now developing within that industry. After briefly summarising the salient points and recommendations, the report is divided into seven parts which deal with the author's visit to the Netherlands Indies, Malaya, Ceylon, France and the United States of America; a proposed Coconut Congress; the copra market in Europe; defibring, spinning, and weaving coir in France; the American market for copra and coconut oil; recommendations; and the effect on the coconut industry of independence. There are also seven appendices. His recommendations are intended primarily to prepare the coconut industry in the Philippines to stand the shocks of political and economic separation from America. He urges that a National Coconut Corporation should be established immediately and that the following steps through that Corporation, or otherwise, should be taken. 1. The improvement of Philippine copra through Government standardization and the establishment of drying plants and coconut centrals. 2. The industrialization of coconut by-products such as the utilization of the husks and shells. 3. The elimination, as much as possible, of the middleman through the establishment of coconut co-operatives throughout the country, and the improvement of credit facilities to coconut planters. 4. The establishment of regular freight and shipping service to foreign countries. 5. The establishment of a Coconut Institute on a Government owned plantation wherein a research and experimental station shall be established exclusively dedicated to the coconut industry. 6. The fostering of greater home consumption of coconut products. These recommendations are to be implemented principally by means of the establishment of small copra driers, large mechanical copra driers and big industrial units for producing finished manufactured products of all kinds from the coconut. It is particularly interesting to note that the small drier specifically recommended is the Malayan type 15 drier, which is the model most favoured by small producers in Malaya. The procedure likely to be followed in the Philippines is that the small farmers in coconut regions will be invited to pledge themselves to dry all their copra in the approved copra driers or copra centrals built by Government and to market their copra through the Government so as to avoid the middle-man. The growers would be carefully instructed how to use these kilns and would be given the option of buying the kilns by means of easy payments New light is thrown on the importance of the coir industry at the present time. Evidence is submitted to show that coconut fibres superior to all other fibres as a raw material for making sand bags owing to its great resistance to rotting which is of particular importance because such bags have to be kept damp. Mr. Kalaw emphasizes that sand bags are required not only for the trenches but also in especially large quantities for the protection of public buildings. In addition he related that coir fibre has now many other important industrial uses which he describes and he urges that the production of coir and coir products should be one of the principal activities of the industrials central which he proposes. It is estimated that the whole plan, covering the remaining six years of the Commonwealth before full independence is reached would cost the Philippines Government no less than P 20,000,000 (Malayan 14,000,000)' This is made up as follows.

5,500 copra driers at P 950 each.	5,225,000
20 provincial centrals at P 82,600	1,652,000
5 national centrals at P 695,000	3,475,000
Coconut institute for experimentation and research	648,000
Loans to planters	9,000,000
Total	P 20,000,000

It has already been approved by the United States Congress that the proceeds of the excise or processing tax on copra and coconut oil entering the U. S. A. accumulated since 1934 which now amount to 200 million pesos, may be used for providing facilities for drying copra and for making loans to planters in the Philippines. It is therefore more than probable that the recommendations made in the report will be adopted.

The Philippine Coconut Industry

(Statistics from Leo Schnurmacher Inc.)

Acreage under coconuts	1,589,000
Total number of palms	121,685,480
Palms in bearing	91,178,800
Total commercial production of copra (Copra equivalents)	850,000 tons.

—*The Coconut Industry.* Report of Hon. Maximo M Kalaw. Bureau of Printing. Manila (unpriced) Review by F. C. C. in the *Mal.Agri. Jour.* (1940) : 374–375.

Manure as Maker of Humus. In a comprehensive discussion on organic and inorganic manures and their relative effectiveness, Sir E. John Russell, D. Sc., F. R. S., Director of the Rothamsted Experimental Station, England, recently gave some interesting facts about farmyard manure. The oldest and best-known method of manuring the land is to give it farmyard manure, and this is not only very effective but also very safe, said Sir John. A man can rarely go wrong with farmyard manure; the chief trouble is he rarely has enough of it. The first serious possibility of using a substitute came about 100 years ago, when chemists analysed farmyard manure and found out the elements of plant food which it supplied. One ton of farmyard manure contains about 12—16 lb. nitrogen; 13—15 lb. potash, and 5—10 lb. phosphoric acid. For making humus in the soil, farmyard manure is one of the common organic manures that is known to be effective. It alone contains straw, and it is the cellulose and lignin in straw that yields humus in the soil; nothing else is known to give it. Cellulose and lignin by themselves, however, are of no value as manure and may indeed distinctly reduce the crop. The reason is very interesting. Micro-organisms that decompose the cellulose and lignin in order to produce humus require nitrogen and phosphate for their own nutrition, and they therefore compete with plants and take up nitrate and phosphate from the soil. When they die, their bodies decompose and may ultimately produce nitrate once more, so that in the end the crop may not suffer, and in the second year it may indeed benefit. Broadly speaking, cellulosic materials require nearly 1 per cent of their weight of nitrogen to effect their decomposition, and this must either be added or taken from the soil. For this reason, organic materials like paper, sawdust, and wood shavings have no direct manurial value in spite of the presence of cellulose and lignin, though if nitrogen and phosphate are supplied they can be composted, forming a humus material that may improve the soil. Even straw by itself is of no direct value as manure; indeed in its first year it may be slightly harmful, though in its second year it may become useful. The value of organic matter as manure depends on three factors: (1) its percentage of nitrogen; (2) the ease with which it decomposes in the soil; (3) the quantity of cellulose, lignin, and similar substances that it contains.— [Press Note, Dominion Department of Agriculture, Canada *Indian Farming*, September 1940]

Gleanings.

Stability of Vitamin C. Many people have the idea that the ordinary methods of cooking destroy all the vitamins. Two years ago Mrs. Boas Fixen reported that the usual processes in the kitchen are unlikely to cause any significant loss of Carotin, Vitamins A, B_1, B_2 complex or D. Vitamin C is unstable but not so much as has been suggested by various authorities. Recent research has shown that cooked and canned fruits and vegetables do actually retain much of their vitamin. Potatoes if boiled in their jackets retain most of their antiscorbutic properties. The real truth is that much of the vitamin goes into the water used for cooking. It is evident that the liquid used for cooking vegetables should be put into the stock pot or used as a basis for soup. (*Food Manufacture 15 (1940)* : 194.

Parthenocarpy. Considerable practical importance is attached to the fact that the ovaries of various fruits may be stimulated to development by foreign pollen quite incapable of effecting fertilization, so that seedless fruits may result. Sadao Yasuda has been studying this subject since 1928 and has recently published a general account of his experiments (Mem. Fac. Sci. and Agric., Taihoku Imperial University, 27, No. 1 : Dec. 1939). Ovaries of egg plants gave fruit with Petunia pollen but the reciprocal cross is without effect ; similarly tomatoes arose from action of the pollen of the egg plant but the reciprocal cross would not work. Various combinations were thus tested, and successful combinations for parthenocarpic fruits showed no connexion with the systematic position of the plants. It was shown that if pollen could germinate and the tubes penetrate deeply into the style, parthenocarpy resulted. The growth of the pollen tubes seems influenced by a special substance in the style ; this substance is produced originally in the ovary, a point checked by ingenious experiments with grafted styles. Where the pollen tube can influence ovary development the effect is produced before the tube reaches the ovary ; it is only necessary that the tube should penetrate deeply into the style Ovaries can grow into seedless fruit if injected with extracts of suitable pollen grains. Pollen grains of the proper species, too old to fertilize ovules and give seeds, may still contain this fruit-producing stimulus and may thus induce seedless fruit production. (*Nature*, 145 : No. 3682, 826—827).

Beetles as Bone Cleaners. An army of beetles has been mustered into the service of cleaning bones of small animals that are to be mounted because the beetles do the job better and quicker than humans. Skeletons and skulls of animals are shipped to the American Museum of Natural History from points as far distant as Persia and Australia and invariably there are scraps of dried meat clinging to them, which must be removed before mounting. The collection of bones is placed in a metal-lined "arena", where they are attacked by hundreds of beetle cleaners. The insects are of a variety propagated from stock received from Africa and Asia. (*Science and Culture* 6 : 204).

Scholarships for Agriculture. The London *Times* announces that Lord Perry, Chairman of the Ford Motor Company, with the approval of the British Ministry of Agriculture, the Henry Ford Institute of Agricultural Engineering, at Boreham, near Chelmsford, is offering 40 free scholarships for the training of British boys for careers in agriculture. The scholarships comprise 10 that are tenable for three years, 10 for two years and 20 for one year Each is valued approximately at £ 175 a year which includes cost of tuition; board and residence during terms at Boreham House, near the Fordson estates; laundry; pocket money during terms and holidays, special clothing and boots. The cost, estimated at £ 7,000 a year, is to

be defrayed by Henry Ford. The intention is to provide theoretical and practical instruction in the latest methods of every branch of farming, with classroom tuition and field work in alternate months, in order to train the boys to become key men in British agriculture. The estates attached to the institute cover 4,000 acres, and are devoted to corn crops, intensive market gardening, glasshouse culture, a fruit section with gas storage and the care of 2,000 pigs, 700 sheep and 200 dairy cattle. Applicants for scholarships will be required to attend the institute for a probationary period of one month, during which the final selections will be made of the prospective recipients. *(Science*, 92: 147).

Crop and Trade Reports.

Sugarcane—1940—Intermediate condition report. The condition of the sugarcane crop is generally satisfactory and the yield is expected to be normal in all districts. The wholesale price of jaggery per imperial maund of 82 2/7 lb. (equivalent to 3,200 tolas) as reported from important markets on 4th November 1940 was Rs. 5—3—0 in Erode, Rs 5—2—0 in Mangalore, Rs. 4—10—0 in Rajahmundry and Cuddalore, Rs 4—5—0 in Vizagapatam, Rs. 4—2—0 in Adoni and Chittoor, Rs. 3—15—0 in Cocanada and Salem, Rs. 3—14—0 in Vizianagaram and Vellore Rs 2—15—0 in Bellary and Rs 2—6—0 in Coimbatore. When compared with the prices published in the last report, i. e., those which prevailed on 7th October 1940, these prices reveal a rise of approximately five per cent in Vizagapatam, four per cent in Erode and three per cent in Rajahmundry and a fall of approximately seven per cent in Salem, five per cent in Cocanada, four per cent in Chittoor and Trichinopoly, three per cent in Coimbatore and one per cent in Cuddalore, the prices remaining stationary in Vizianagaram, Adoni, Bellary, Vellore and Mangalore. *(From the Director of Industries and Commerce).*

Cotton—1940-41—Intermediate monthly report. In the central districts and the South, the sowings of cotton are still in progress in parts. In parts of the Tinnevelly district, the early sown rainfed crop was attacked by surface weevils and resowing had to be done. The area under the crop in the Central districts and the South is expected to be normal or slightly above normal. In the Deccan, the sowings of *hingari* or late cotton have concluded and the area is expected to be normal outside Anantapur where it is expected to be below normal. The crop is progressing well. Pickings of the *mungari* or early sown cotton have commenced in parts of the districts of Bellary and Anantapur. The yield is expected to be below normal. The local cotton trade is not generally active at this time of the year. The average wholesale price of cotton lint per Imperial maund of 82 2/7 lbs as reported from important markets on 4th November 1940 was Rs. 15—10—0 for Cocanadas, Rs. 17—6—0 for white Northerns, Rs. 18—2—0 for red Northerns, Rs. 14—15—0 for Westerns (mungari), Rs. 18—14—0 for Westerns (jowari), Rs. 29—5—0 for Coimbatore Cambodia, Rs. 23—11—0 for Southern Cambodia, Rs. 28—8—0 for Coimbatore Karunganni, Rs. 23—2—0 for Tinnevelly Karunganni, Rs 22—1—0 for Tinnevellies and Rs. 22—13—0 for Nadam cotton. When compared with the prices published in the last report, i. e, those which prevailed on 30th September 1940, the prices reveal a rise of about six per cent in the case of Westerns *(jowari)* and Coimbatore Karunganni, five per cent in the case of Westerns *(mungari)*, two per cent in the case of Nadam cotton and one per cent in the case of Coimbatore Cambodia, the prices remaining stationary in the case of Cocanadas and Northerns (red and white varieties). *(From the Dirctor of Industries and Commerce).*

Groundnut-1940-Intermediate condition report. The winter crop of groundnut has been affected to some extent by heavy rains and floods in Kistna, by drought in Anantapur, Chingleput, South Arcot, Chittoor and North Arcot and by insect pests in Tanjore and Madura. The condition of the crop is generally

satisfactory in the rest of the Province. The wholesale price of groundnut (shelled) per Imperial maund of 82⅔ lb. (equivalent to 3,200 tolas) as reported from important markets on 4th November 1940 was Rs. 3—12—0 in Tadpatri, Rs. 3—10—0 in Vizagapatam and Guntur, Rs. 3—9—0 in Hindupur, Rs. 3—8—0 in Vizianagaram and Cuddalore, Rs. 3—7—0 in Nandyal and Vellore, Rs. 3—6—0 in Cuddapah, Rs. 3—5—0 in Coimbatore, Rs. 3—3—0 in Adoni and Bellary and Rs. 3—2—0 in Salem and Guntakal. When compared with the prices published in the last report, i. e., those which prevailed on 7th October 1940, these prices reveal a rise of approximately seven per cent in Tadpatri and four per cent in Coimbatore and a fall of approximately 17 per cent in Salem, 13 per cent in Vizagapatam, ten per cent in Cuddapah and Cuddalore, eight per cent in Nandyal, four per cent in Bellary and two per cent in Adoni, the price remaining stationary in Hindupur. *(From the Director of Industries and Commerce).*

Gingelly—1940-41—Intermediate condition report. The gingelly crop has been affected to some extent by drought in South Arcot, Tanjore and Madura. The yield is expected to be normal outside these districts. The wholesale price of gingelly per imperial maund of 82⅔ lbs. (equivalent to 3,200 totals) as reported from important markets on 4th November 1940 was Rs. 7—0—0 in Tinnevelly, Rs. 6—9—0 in Trinchinopoly, Rs. 6—7—0 in Cuddalore, Rs. 6—4—0 in Vizianagaram, Rs. 5—15—0 in Ellore, Rs. 5—12—0 in Vizagapatam, Cocanada, and Salem, Rs. 5—11—0 in Rajahmundry and Rs. 5—8—0 in Tuticorin. When compared with the prices published in the last report, i. e., those which prevailed on 7th October 1940, these prices reveal a rise of approximately seven per cent in Vizagapatam, four per cent in Ellore and Tuticorin and a fall of approximately eight per cent in Cocanada, three per cent in Tinnevelly and two per cent in Rajahmundry, the prices remaining stationary at other centres. *(From the Director of Industries and Commerce).*

Paddy—1940-41—Intermediate monthly report. The harvest of first crop paddy has concluded in parts of the Circars, Chingleput, the Central Districts, the South and the West Coast. The yield is expected to be generally normal. In parts of Ramnad, rainfed paddy was affected by surface weevils and re-sowing had to be done. The condition of the crop is reported to be generally satisfactory outside Chingleput and Chittoor. The wholesale price of paddy, second sort, per Imperial maund of 82⅔ lbs. as reported from important markets on 4th November 1940 was Rs 3—8—0 in Masulipatam and Madura, Rs. 3—7—0 in Rajahmundry and Guntur Rs. 3—6—0 in Cocanada, Ellore and Bezwada, Rs. 3-3-0 in Tinnevelly, Rs. 3—2—0 in Vellore, Trichinopoly and Virudhunagar, Rs. 3—0—0 in Vizianagaram, Rs. 2—14—0 in Chittoor, Rs. 2—13—0 in Kumbakonam and Hindupur, Rs. 2—9—0 in Negapatam, Rs 2—6—0 in Cuddalore and Rs. 2—4—0 in Conjeevaram. When compared with the prices published in the last report, i. e., those which prevailed on 7th October 1940, the prices reveal a rise of about 10 per cent in Masulipatam, eight per cent in Bezwada, seven per cent in Kumbakonam, six per cent in Cocanada, Rajahmundry, Ellore, Guntur, Madura and Tinnevelly and two per cent in Hindupur, Trichinopoly and Virudhunagar and a fall of five per cent in Cuddalore, the prices remaining stationary at Vizianagaram, Conjeevaram, Chittoor Vellore and Nagapatam.

(From the Director of Industries and Commerce).

Cotton Raw in the Madras Presidency. The receipts of loose cotton at presses and spinning mills in the Madras Presidency from 15th February to 8th November 1940 amounted to 481,296 bales of 400 lb lint as against an estimate of 366,800 bales of the total crop of 1939-40. The receipts in the corresponding period of the previous year were, 449,099 bales. 480,658 bales mainly of pressed cotton were received at spinning mills and 116,378 bales were exported by sea while 119,910 bales were imported by sea mainly from Karachi and Bombay.

(From the Director of Agriculture, Madras)

College News and Notes.

Students' Corner. *The Hostel Tatler.* Though late in its appearance, the 'Hostel Tatler' released during the first week of November was given a warm reception. The Editorial Board deserves to be congratulated for producing a thoroughly readable number.

Terminal Examinations. The second terminal examinations are programmed to commence on the 10th December and terminate by the 23rd December.

Games. As in previous years, the inter-collegiate competitions in hockey, cricket, football and athletics among colleges in the Bangalore zone were held at Coimbatore on the Agricultural College grounds. The unusually heavy rains received in the first half of November were responsible for prolonging the stay of the visiting teams at Coimbatore.

Hockey. In hockey the Agricultural College met the Islamiah College, Vaniambadi in the first round and won by 8 goals to nil. The next match was with Voorhee's College, Vellore and proved to be a keenly contested game which ended in a draw. The match had to be replayed three times before the Agricultural College emerged winners by one goal to nil. The third round found us pitted against our local rivals—the Government Arts College, Coimbatore. This again proved to be a keenly contested affair and twice ended in a draw. At long last, we won the match by two goals to nil and became winners in the Bangalore Zone.

Cricket. In cricket we met the Government Arts College, Coimbatore and snatched a convincing victory The College skipper's unbeaten century was the outstanding feature of the match. Our next match which happened to be the zone final was against H. E. H. the Nizam's College, Hyderabad. In this encounter our colours were lowered by a superior team. Hyderabad scored 307 to which we replied with a poor total of 87 runs. The tall score of our opponents is not so much an index of their batting prowess as of serious lapses in our fielding.

Football. We lost our opening match with the Government College, Coimbatore by two goals to nil. The second round found the Government College against Islamiah College, Vaniambadi which ended in a draw but in the replay the former won by one goal to nil. In the third round, the Government College played the Voorhees' College, Vellore. Here again, the first match was a draw, but the Government College won by an odd goal in the replay. In the finals, the Government College met Nizam's College, Hyderabad in a very fast and exciting game which was won by Hyderabad by six goals to three.

Athletics. The St. Joseph's College, Bangalore which did not participate in other competitions were well represented at the Athletic sports. Consistent with their tradition they secured the largest number of points and won the zone championship. Hyderabad was a keen competitor and secured the second place. Our college had to rest content with second places in three events—110 metre hurdles, pole vault and shot-put.

Academic Council. Mr. T. V. Subramania Ayyar, Assistant Entomologist was elected unopposed as a member of the Madras University Academic Council to represent the teaching staff of the College ... the seat vacated by Mr. H. Shiva Rao.

Association of Economic Biologists. A meeting of the Association was held on the 8th November at which the following papers were read. (1) Preliminary studies on *Antigastra Catalaunalis* Dup., a pyralid caterpillar pest on gingelly by

M. C. Cherian and Mohammed Basheer and (2) The perennial or tree-castor by C. M. John and U. Narasinga Rao.

Ladies' Club. The annual club day of the Agricultural College Ladies' Club was celebrated on Saturday the 23rd November. This was preceded by a dinner which was held on the 20th. The programme on the 23rd included several items of open sports for women and children and a variety entertainment in which several members and their children participated.

Visitors. Mr. Peri Sundaram, Bar-at-Law a member of the Ceylon delegation to India visited the College and Research Institute during the month.

OBITUARY

The late K. Rajabapaniah :— We deeply regret to record the sad demise of K. Rajabapaniah, B. Sc. Ag. in September last. He was born on 6th June 1912 and entered departmental service on 3rd May 1937. Young in age, full of promise as a specially trained Farm Manager for fruit work in Guntur, it is sad to hear of his death from that fell disease, tuberculosis. We offer heartfelt condolences to the members of the bereaved family.

The late C. Ranganatha Mudaliar :— We record with deep regret the death of Mr. C. Ranganatha Mudaliar on 4—11—40 after a brief illness. He was born in March 1889, and joined the department as artist in 1918. He was an un-ostentatious worker and it is sad that he died in harness after twenty two years of hard service. We offer our sincere condolences to his relatives in their sad bereavement.

Mofussil News & Notes

A small agricultural exhibition was conducted under the auspices of the Local Agricultural Association at Poovanur, one of the centres of work in Mannargudi Taluk on the 20th October 1940 during the *Kumbabishekam* festival of the local temple. The different departmental exhibits, e. g. Aduturai and Coimbatore strains of paddy, green manure seeds, fodder crops, iron ploughs, Settun puddler and pictorial posters etc., were exhibited at the stall. Practical demonstration with the Settun implement in incorporating pungam leaves for *Thaladi* paddy crop was conducted in an area of 70 cents, amidst a gathering of 50 ryots. They evinced keen interest in its working. About 750 people visited the exhibition stall. A lecture was delivered on the occasion by the Asst. Agricultural Demonstrator, Mannargudi appealing to the audience for adoption of Departmental improvements on a mass scale.

A. G. N.

Weather Review—OCTOBER 1940.

RAINFALL DATA

Division	Station	Actual for month	Departure from normal @	Total since January 1st	Division	Station	Actual for month	Departure from normal @	Total since January 1st
Circars	Gopalpore	4·3	−3·7	71·9	South	Negapatam	7·9	−2 6	15·1
	Calingapatam	3·4	−4·6	45·8		Aduthurai *	0 0	0·0	00·0
	Vizagapatam	6·0	−1·1	32·0		Madura	4·0	−3·8	28·7
	Anakapalli *	5·1	−2·8	39·6		Pamban	9·4	+0·4	21·3
	Samalkota*					Koilpatti*			
	Maruteru*	4·5	−6·2	36·9		Palamkottah	4·7	−2·1	15·0
	Cocanada	6·0	−1·9	39 7					
	Masulipatam	10·3	+2·2	33·7					
	Guntur*	2·3	−4 0	29·9	West Coast	Trivandrum	12·0	0·0	58·9
						Cochin	16·9	+3·7	119·2
Ceded Dists.	Kurnool	3·8	+0·3	28·9		Calicut	12·8	+2·6	121·3
	Nandyal*	0·0	0·0	0·0		Pattambi *	9·5	−2·3	91·9
	Hagari *	5·0	+1·3	20·9		Taliparamba *	8·9	−3 6	141·6
	Siruguppa*	6·1	+1·9	23·2		Kasargode *	6·7	−2·9	140·8
	Bellary	4·6	+0·7	21·5		Nileshwar*	8·5	−0·8	150·6
	Anantapur	13·3	+9·6	24·2		Mangalore	11·1	+3·6	141·6
	Rentachintala	3·8		24·3					
	Cuddapah	6·4	+1·4	33·9					
	Anantharaju-pet*	6·0	+0 6	25·8	Mysore and Coorg	Chitaldrug	11·4	+7·1	32·3
						Bangalore	2·9	−3·0	29·5
Carnatic	Nellore	8·7	+0·3	27·1		Mysore	2·8	−3·7	34·5
	Madras	6·2	−5 5	24·2		Mercara	6·6	−2·1	134·6
	Palur *	6·1	−3·4	22 8					
	Tindivanam *	5·5	−3·5	24·6	Hills	Kodaikanal	9·0	−0·7	48·5
	Cuddalore	9 5	−1·5	27 3		Coonoor			
Central	Vellore	5·3	−1·0	25·3		Ootacamund *	5·2	−7·9	39·8
	Salem	1·8	−4·9	36·1		Nanjanad *	6 4	−0·9	40·4
	Coimbatore	4·6	−1·8	24·2					
	Coimbatore A. C. & R. I.*	2·5	−3·3	17·7					
	Trichinopoly	5·5	−1·4	22·7					

* Meteorological Stations of the Madras Agricultural Department.

@ From average rainfall for the month calculated upto 1937 published in the Fort St. George Gazette.

The weather over the peninsula was mainly dry during the first 3 days of the month. Local thunderstorms occurred along the North Madras Coast, South East Madras, Mysore and Malabar on the 4th and 5th instants. On the 7th conditions became unsettled off the coromandel coast but did not develop. Between 6th and 8th thunder storm activity increased in the Peninsula and fairly widespread moderate to heavy rainfall occurred in the east and south of that region, extending to the south Konkan, and south and east Deccan.

On the 10th a disturbance appeared as a depression off the Konkan coast, moving in a northwesterly or northerly direction initially and north eastwards thereafter, it intensified into a severe cyclonic storm and crossed the Konkan coast near Bombay on the 16th and advanced to near Surat. It weakened into a depression and remained stationary there until it disappeared by the 21st. Associated with the movement of the storm, a spell of wet weather prevailed

over the peninsula. Fairly widespread rains were received along the Konkan and Malabar coasts.

On the 19th conditions became unsettled in the central Bay of Bengal and concentrated into a storm on the 20th with its centre near lat. 17° north, long. 87° east. Taking a north-easterly direction the storm passed inland during the night of the 21st and lying over east Bengal as a depression, centred near Dacca next morning, it filled up in the evening. It caused fairly widespread rain along the Orissa coast.

Conditions became unsettled on the south east Arabian sea off the Malabar coast on the 25th, but became unimportant onthe 27th. Widespread thunder showers occurred during the last week in Malabar and local thunder showers in south east Madras and south Konkan.

On the 28th the North East Moonsoon set in over the south of the Peninsula and widespread rain occurred in South East Madras, Mysore and Malabar while local rains fell in Madras, Deccan and along the north Madras coast.

Rainfall was generally in defect except locally in the Ceded districts and Mysore; other climatic elements were not far from normal.

The chief falls of rain reported were:

Calicut	...	7·5″ (10th)
Chitaldrug	...	4·0″ (10th)
Cuddalore	...	3·5″ (31st)
Cochin	...	3·3″ (10th)
Negapatam	...	3·2″ (30th)
Masulipatam	...	3·1″ (8th)
Mangalore	...	3·0″ (15th)

Weather Report for the Agricultural College and Research Institute Observatory.
Report No. 10/40.

Absolute maximum in shade	...	94·0°
Absolute minimum in shade	...	62·8°F
Mean maximum in shade	...	89·1°F
Departure from normal	...	+1·6°F
Mean minimum in shade	...	70·1°F
Departure from normal	...	−0·3°F
Total rainfall for the month	...	2·45 inches.
Departure from normal	...	−3·25 ,,
Heaviest fall in 24 hours	...	0·80 ,,
Total number of rainy days	...	5
Mean daily wind velocity	...	1·42 m. p. h.
Departure from normal	...	−1·41 ,,
Mean humidity at 8 hours	...	73·4%
Departure from normal	...	−6·5%

Summary. There were some premonsoon rains during the month and 2·45 inches of rain were recorded which was below the normal. The sky was moderately clouded and the relative humidity was below the normal. The mean maximum temperature was slightly above the normal while the mean minimum was nearly normal. The wind velocity was below normal.

(P. V. R. & R. S.)

Departmental Notifications.

Gazette Notification.

Appointment.

Sri. P. Krishna Rao, Assistant, Millet Section, in Class I of the Madras Agricultural Subordinate Service, is appointed to act in Category 8, Class I Madras Agricultural Service, as temporary Gazetted Assistant to the Principal, Agricultural College, Coimbatore from the date of taking charge.

Subordinate Services.

Transfers.

Name of officers.	From	To
Sri. V. V. Rajagopalan	Offg. Assist. in Entomology	A. D., Dharapuram.
„ C. A. Ramalingam Pillai,	A. D., Ambasamudram	A. D., Koilpatti.
„ K. Dorai Raj,	Offg. Asst. in Paddy, Coimbatore.	A. D., Cuddapah,
Janab A. Abdul Samad Sahib	D. F. S., Hagari	Asst. in Paddy, Coimbatore.
Sri. S. Kuppuswami Ayyangar,	A. D., (on leave)	A. D., Tindivanam.
Mr. K. M. Jacob,	A. D., (on leave)	A. D., Wynaad.
Sri. P. Kesavanunni Nambiar,	A, D., Wynaad	F. M., A. R. S., Taliparamba.
„ E. Achuthan Nair,	F. M., A. R. S. Taliparamba	A. D., Harur.
Janab Muhammad Faisuddin Sahib,	F. M., under training, A. R. S., Guntur.	Off. Asst. in Cotton, Coimbatore.
„ Muhammad Zainulabdeen Sahib,	Off. F. M. under training A. R S, Guntur	Temporary Asst. in Cotton, Narasaraopet.
Sri. T. V. Srinivasa Charlu,	A. F. M, A. R. S. Aduthurai.	A. D., Tanjore on relief
„ S. Krishnamurthi Rao,	A. D., Hospet,	A. D., Alur.
„ B. V. Ramana,	A. D., on special duty Sugarcane Growers' Society, Bobbili	A. D., Tuni.

Leave.

Name of officers.	Period of leave.
Dr. C. Narasimha Acharya, Asst. in Chemistry (on foreign service)	Extension of L. a. p. on m. c. for 1 month from 3—11—40.
„ M. P. Kunhikutti, Asst. Marketing Officer, Madras.	L. a. p. for 4 months from 16—9—40.
Sri. L. Krishnan, A. D., Tanjore	L. a. p. for 2 months from 8—11—40.
„ N. C. Tirumalachari, A. D., Srivilliputtur.	L. a. p. for 1 month and 19 days from 5—11—40.

Sri. M. R. Balakrishnan, Asst. in Chemistry A. R S , Siruguppa,	Extension of l. a. p. on m. c for 3 months from 17—10—40.
„ S. P. Fernando, A. D. Harur	L. a. p. on m. c. for 3 months from 11—10—40.
„ A. B. Adisesha Reddy, A. D. Alur	L. a p. for 1 month and 20 days from 4—11—40.
„ E. Kunhappa Nambiar, Upper Subordinate (on leave)	Extension of l. a. p. for 1 month and 18 days from 6—11—40.
„ B. M. Padmanaba Ayyar, A. D., Gingee.	Extension of l. a. p. for 1 month from 1—11—40.
„ Bhairy Siva Rao, A. D., Tuni	L. a. p. for 4 months on m. c. from 5-12-40.
„ R. Narasimha Ayyar, A. D., in Mycology.	L. a. p, for 1 month from 15—11—40.
„ L. Sankarakumara Pillai, A. D., Rasipuram.	Extension of l. a. p. on m. c. for 3 months from 4—11—40.
„ T. Dakshinamurthi, A. D. Adoni.	L. a. p. for 1 month from 14—11—40.
„ N. Ranganathachari, A. D., Dhone.	L. a. p. on m. c. for 1 month from 18—11—40.